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ing position which our country has taken in the extraordinary development of astronomical science during our generation can alone justify the unparalleled expenditure of our government upon its observatory.

2. The results of this expenditure through the ten years since the completion of the new observatory should have been its general recognition as the leading observatory of the world in at least some important field of the sciences. With its great advantages over old-fashioned Greenwich and Paris, it should have left both these institutions in the rear.

3. Has it done anything of this kind? Is any work of prime importance in astronomical science being pursued? Do the astronomers of our own or any other country set that high price upon its output which it should command in the world of science? The claim has been made over and over by authorities too high to be ignored that these questions must be answered in the negative. The only official rejoinder to them which we can find is a very free use by the head of the observatory of such terms as 'malice,' 'animosities' and 'prejudices' in his recent annual reports. Did the criticisms in question allege overt wrong-doing, this sort of defence might be more or less in place. But a better defence to the charge that the observatory has been doing nothing of importance would be the showing of something important that it has done.

4. The conduct of the institution can add nothing to the efficiency of the naval service, and must subtract from rather than add to its high character in the eyes of the

world. The very appellation 'naval' is a misnomer.

5. The idea that even the best officer in the navy, which the new appointee may well be, can take up the present ill-organized institution, with its imperfect and often antiquated instruments, and its absence of definite aim, and lead the astronomical force on to that position which the establishment should assume in the world of science, is one that cannot be entertained by any impartial reviewer of the situation.

Under these circumstances, should the body of astronomers who desire to make their national institution a worthy representative of their science relax their efforts to bring this result about? Were there any doubt as to the reasonableness and justice of their cause—could even the show of a case against their view be made—they might well abandon their efforts in despair. But when the system against which they contend is so injurious to the good name of American science, and at the same time completely indefensible as it seems to us to be, patriotism and a due regard for the dignity of their science will not allow us to doubt that ultimately success must attend their efforts.

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. SECTION C, CHEMISTRY.

THE meetings of Section C of the American Association for the Advancement of Science were held in common with those of the American Chemical Society from June 30 to July 3. The meeting place was the chapel of the Bellefield Presbyterian Church, Pittsburgh. During the first two days the meetings were in charge of the

officers of the American Chemical Society, and under the presidency of Dr. Ira Remsen. On July 2 and 3, Vice-president Dr. H. A. Weber, of Ohio State University, presided.

Of the sixty-nine papers which were announced, fourteen were upon subjects relating to industrial chemistry, thirteen were in the domain of physical chemistry, thirteen were devoted to organic, five to inorganic and twelve to analytical chemistry. Among the papers presented were the following:

*Arsenic Pentachloride:* CHAS. BASKERVILLE and H. H. BENNETT. Abstract published in the issue of SCIENCE for August 8.

*Preparation of Pure Praseodymium Compounds:* CHAS. BASKERVILLE and J. W. TURRENTINE. Abstract published in the issue of SCIENCE for August 8.

*The Deportment of Pure Thorium and Allied Elements with Organic Bases:* CHAS. BASKERVILLE and F. H. LEMLY.

*The Chlorids of Ruthenium:* JAS. LEWIS HOWE.

Until a few years ago, the only known chlorid of ruthenium was of the type  $\text{RuCl}_3$ ,  $2\text{R}'\text{Cl}$ . Claus's tetrachlorid was shown by Joly to be a nitroso-chlorid, of type  $\text{RuCl}_3\text{NO}$ ,  $2\text{R}'\text{Cl}$ . Several years since Antony described a tetrachlorid,  $\text{RuCl}_4$ ,  $2\text{KCl}$ . At the last meeting the author described the cesium and rubidium salts of the types  $\text{RuCl}_4$ ,  $2\text{R}'\text{Cl}$ ,  $\text{RuO}_2\text{Cl}_2$ ,  $2\text{R}'\text{Cl}$  and  $\text{RuCl}_3\text{H}_2\text{O}$ ,  $2\text{R}'\text{Cl}$ . The method of forming this latter, called an 'aquo'-salt, was not then known. It has now been found that the salts of this 'aquo' series are formed by boiling the salts of the type  $\text{RuCl}_3$ ,  $\text{R}'\text{Cl}$ , with alcohol and dilute  $\text{HCl}$ . These are dehydrated at  $180^\circ$ – $200^\circ$ , giving salts of an isomeric  $\text{RuCl}_3$ ,  $2\text{R}'\text{Cl}$ , differing greatly from the ordinary  $\text{RuCl}_3$ ,  $2\text{R}'\text{Cl}$  in

properties. They become hydrated again on treatment with water. The 'aquo' salt, on addition of chlorin, gives the tetrachlorid.  $\text{RuCl}_4$ ,  $2\text{KCl}$  is a black salt with greenish tint, very soluble and instantly decomposed by water, differing entirely from the salt described by Antony. Using Antony's method, no salt higher than the trichlorid could be obtained, but a hydrated salt,  $\text{RuCl}_3$ ,  $2\text{KCl}$ ,  $\text{H}_2\text{O}$ , differing from the 'aquo' salt was found. This is probably identical with that described by Miolati.

By the action of stannous chlorid on ruthenium trichlorid beautiful red isometric octahedra were obtained, which contained ruthenium, tin, chlorin and an alkali, and in which the ratio of ruthenium to tin is 1:12.

*An Explanation of Valence and Stereochemistry:* THEODORE W. RICHARDS.

Attention was called to the fact that the valence of an element is probably connected with its compressibility, since in general the greater the compressibility, the less is the valence. It was shown that this relationship is easily explained with the help of the hypothesis assuming that atoms are compressible and elastic throughout their whole substance (Richards, *Proc. Am. Acad.*, 37, 1, 1901; 399, 1902; *Zeitschr. Phys. Chem.*, 40, 169, 597, 1902). The carbon atom, with small atomic volume and compressibility would naturally possess high valence, and four larger atoms on combining with it would distort it into the tetrahedron demanded by the theory of van't Hoff and Le Bel. The disposition of the four added atoms on the *faces* instead of the *points* of the tetrahedron thus formed would of course make no difference in the geometric relation. If the four added atoms were all different, they would cause an asymmetric distortion of the carbon atom. The electrical relations of valence were purposely omitted from the discussion.

These and other aspects of the question will receive consideration in the more complete paper soon to be published in the *Proceedings of the American Academy* and the *Zeitschrift für physikalische Chemie*.

*The Exactness of Faraday's Law:* T. W. RICHARDS.

After reviewing work done in cooperation with E. Collins and G. W. Heimrod (which showed that Faraday's law holds with great accuracy for aqueous solutions and ordinary temperatures), the speaker described some more recent work done with the assistance of W. N. Stull. The weight of silver deposited in the 'porous cup voltameter' of Richards and Heimrod was compared with the weight deposited by the same current from a solution of argentic nitrate in fused sodic and potassic nitrates at 300°. After taking several precautions which cannot be described here, and subtracting the weights of alkaline nitrates included in the silver crystals, it was found that the weights were identical within the limits of error of the experiment (about 0.005 per cent.). This investigation places Faraday's law among the most exact and invariable of the laws of nature.

*The Electrical Conductivity and Freezing Points of Aqueous Solutions of Certain Metallic Salts of Tartaric, Malic and Succinic Acids:* O. F. TOWER.

In an article about two years ago it was shown that the molecular conductivity of aqueous solutions of the tartrates of nickel and cobalt was very low, and also that the freezing point lowerings yielded molecular weights greater than those calculated from the simple formulas. These results have been confirmed and similar determinations made with the tartrates of magnesium, barium and manganese, and the malates and succinates of nickel, cobalt and magnesium. The results show that magnesium tartrate acts, as it may be termed, normally.

The tartrates of barium and manganese give results but little different from those of magnesium tartrate. Nickel and cobalt malates yield results considerably different from those of magnesium malate, but the difference is not so great as between the tartrates of the same metals. The succinates of nickel and cobalt act not greatly different from magnesium succinate. The malates and tartrates of nickel and cobalt seem to be polymerized in aqueous solution, the malates, however, less so than the tartrates. The polymerizing influence is dependent on the presence of an hydroxyl group in the acid radicle, and this influence is stronger the greater the number of these groups present.

*A Thermochemical Constant:* F. W. CLARKE.

The author has studied the heats of combustion of organic compounds, as determined by Thomsen. These data represent substances burned as gas, with production of gaseous carbon dioxide and *liquid* water. By a simple correction applied to the last-named factor all the equations of combustion may be reduced to the gaseous form throughout, under uniform conditions of temperature and pressure. So adjusted, by application of a definite formula, nearly every equation yields a constant which is identical in value with the neutralization constant of strong acids and gases. The average, in 66 cases, is 13,773 small calories. From this constant, and the original equations, the conclusion is reached that the *absolute* heat of formation, from gaseous, dissociated atoms, of the aliphatic hydrocarbons and their simpler derivatives, is proportional to the number of atomic linkings within the molecule. In this calculation every linking counts as one, and single, double or triple unions between carbon atoms become identical as regards their thermal value. The conclusion is revolu-

tionary, but it represents a satisfaction of the equations, which are otherwise indeterminate. The preliminary paper contains sixty-six verifications of the new law.

*On Conductivity:* GEO. A. HULETT.

1. Advantages of saturated solutions as a basis for conductivity of electrolytes.

2. The values for saturated solutions of gypsum are of the correct magnitude for determining the capacity of conductivity cells, and have been proposed by Kohlrausch, but his results are affected by surface tension.

3. Definiteness and reproducibility of normally saturated solutions, and the equation

$$(\lambda' = .002206 + .0000456(t - 25) + .000000163(t - 25)^2)$$

for normally saturated solutions from 10° to 30° calculated from observed data.

4. Sources of error in the Arrhenius cells and water conductivity.

*Beziehung zwischen osmotischem Druck und negativem Druck (Relation between Osmotic Pressure and Negative Pressure):*

GEORGE A. HULETT.

1. It will be necessary here to go somewhat into detail concerning the important property of liquids known as negative pressure (or better perhaps, tensile strength of liquids) reviewing the work of Berthelot (*An. chim. phys.* (3), 30, 232), Worthington (*Phil. Trans.*, 1893), Jolly and Nixon.

2. The dissolved substance, under the influence of osmotic pressure, diffuses to the boundary of the solvent, where it first finds 'foothold' and exerts a pressure normally to the surface equal to the osmotic pressure, and this is a negative pressure on the solvent since it tends to increase the volume of the solvent. This pressure is resisted by the tensile strength of the solvent (which has been measured directly by Worthington and Hulett).

3. A solution in equilibrium with its vapor must then be considered as a system with *unequal* pressures on the two phases. The vapor is subjected only to its own equilibrium pressure, while the liquid is subjected to a very considerable negative pressure (equal to the osmotic pressure).

Such a system, considered from the standpoint of thermodynamics, shows a relation between the negative pressure, molecular volume of the solvent and volume occupied by a gram molecule of the vapor,  $(\Delta = \frac{Pg}{v})$ .

This shows *why* osmotic pressure lowers the vapor pressure, while the van't Hoff equation  $\Delta = \frac{RT^2}{\lambda}$  shows only that  $\Delta$  is proportional to  $RT^2$  and  $1/\lambda$ , and it seems that this is only indirectly proportional.

4. Calculation by means of the equation from known data, of the change of vapor pressure due to a given osmotic pressure and comparison with the known changes.

5. The experimental work consists in the direct observation of change of vapor pressure when negative pressure is applied *mechanically* to the liquid alone, with a brief description of the apparatus.

*The Expansion of a Gas into a Vacuum and the Kinetic Theory of Gases:* PETER FIREMAN.

The expansion of a gas into a vacuum is accompanied by no change of energy. If, however, the experiment is carried out by means of two communicating vessels of equal size, one containing a gas under a given pressure and the other being vacuum, then, on allowing the gas to enter into the vacuum vessel, we observe a rise of temperature in the latter and an equal fall of temperature in the former. Why so? A plausible explanation would be perhaps this: As soon as a little of the gas has entered the empty vessel the rest of the gas will do work on it, causing a rise of the tem-

perature in one and a simultaneous lowering in the other vessel. Such an explanation, however, is unsatisfactory. How can elastic particles (molecules) do work on elastic particles? From the impacts of elastic molecules at a given temperature but with all degrees of velocity, there can result nothing other than all degrees of velocity with the same temperature (only the mean free path would become greater, but this does not affect the velocities). Why then the change of temperature? In my opinion the reason is as follows:

Consider the first molecules near the opening into the vacuous vessel. Suppose a very quick molecule enters into the vacuum; it will retain its high velocity. Suppose further a slow molecule enters into the empty vessel, it will soon be overtaken by a quick one and exchange velocities (according to the law of impacts between elastic bodies) with it. In brief, for a short time there will be, in the empty vessel, only quick molecules, and consequently in the other vessel only slow ones. We have here, as it were, a separation (fractionally) into quick and slow molecules which causes the observed changes of temperature.

*The Use of Potassium-ferric Chloride for the Solution of Steel in making the Determination of Carbon:* GEO. WM. SARGENT.

Ferric chloride reacts upon the steel drillings according to the equation:  $\text{Fe} + 2\text{FeCl}_3 = 3\text{FeCl}_2$ . The reaction takes place best as in the case of the copper salt, in the presence of potassium chloride. To prepare the salt, dissolve 267 grams of the c. p. ferric chloride of commerce, which contains about fifty per cent. of  $\text{FeCl}_3$ , and 130.7 grams of potassium chloride in a liter of water. Two hundred cc. of this solution will decompose a factor weight of drillings in the same time as the double chloride of copper and potassium. Free hydrochloric

acid should not be in excess of the ratio of 1 cc. to 225 cc. The amount of acid should be just sufficient to prevent the formation of any basic salt of iron. By chlorinating the filtrate from the carbon (see *Jour. Am. Chem. Soc.*, 22, 210), it may be used to decompose a second lot of drillings. This may be repeated until sufficient iron has accumulated to permit of the addition of more potassium chloride and a further dilution. The solution after it has decomposed a weight of drillings remains transparent, unlike the copper salt; hence the point when the decomposition of the drillings is complete is readily ascertained. This fact, together with the ease with which one can observe how the filter is holding the carbon, as well as the economy of the process, recommend it. (The article will be published in the *Journal of the American Chemical Society*.)

*Condensation of Chloral with the Nitranilins:* ALVIN SAWYER WHEELER, and H. R. WELLER.

Chloral readily reacts with the three nitranilins with the elimination of water, forming condensation products. If the temperature is kept down, addition products are first formed. The condensation products are beautiful crystalline yellow bodies. We name them 'trichlorethylidendi-nitrophenamines.' The melting points are: o-body,  $171^\circ$ ; m-body,  $212^\circ$ ; p-body,  $218^\circ$ , uncorr. The para-body was prepared in 1898 independently by Eibner and by Baskerville.

*The Electrical Conductivity of Urine and its Relation to Chemical Composition:* J. H. LONG.

In this paper six complete analyses of normal urines were given along with the electrical conductivity. It was then shown that nearly the same conductivities are obtainable by combining the inorganic salts in the proportions as found by analysis,

the effects of the urea and other organic bodies being but slight. In a lengthy series of tests the variation in conductivity throughout the day is determined. The whole of the day's urine was collected in three-hour periods and in each portion the conductivity was found, and also the amount of chlorine and urea. By calculating the chlorine as sodium chloride and estimating the conductivity of this, by subtraction the element of the conductivity due to other salts is obtained. This becomes a factor of some importance in the study of body metabolism at different periods through the day. The urines of different individuals are compared.

*Gluten Feeds, Determination of Fat and Acidity:* EDWARD GUDEMAN.

Drying corn gluten feeds in hydrogen, vacuum or air modifies them sufficiently to give low results for the percentage of fat. It increases the acidity of the extracted fat. Gluten meals containing 5.16 per cent. fat before drying gave 3.56 after drying. Acidity of fats extracted before drying, 5-15 per cent., and acidity of fats extracted after drying 20-40 per cent. Acidity of feed materially influenced by the indicators; methyl orange neutral to alkaline, rosolic acid 6-7 acidity and phenolphthalein 11-12 acidity. Acidity of feeds is due to acid salts and is no criterion of quality of feed or of raw materials from which they were made.

*A Novel Constant High Temperature Bath:* CHARLES BASKERVILLE.

A drawing was shown of the bath, which is essentially an iron water-bath with asbestos jackets wherever exposed and a double cover, one being copper. An iron float, provided with depressions to fit platinum crucibles, which rests upon the fusible alloy, is held in position by copper springs reaching to the copper flange of the bath. A cylindrical handle rises verti-

cally from the center of the float; just above the asbestos cover the iron cylinder is sufficiently large to contain a thermostat by which the gas is controlled. The two covers are provided with slits that they may be placed and removed when the float is in position. A brass sheath containing a thermometer graduated to 550° C. passes through the covers, projecting within one of the crucible depressions. The bath is being used in redetermining the atomic weight of thorium according to the method of C. Krüss, and was paid for in part by a grant from the American Association for the Advancement of Science. (Will appear in the *Journal of the American Chemical Society*.)

*Quantitative Blowpipe Analysis by Bead Colorations:* JOSEPH W. RICHARDS and WALTER S. LANDIS.

Dr. V. Goldschmidt, of Heidelberg, Germany, has constructed a plate of colored glass, showing the various tints characteristic of the metallic oxides when dissolved in borax bead or salt of phosphorus bead, in the oxidizing or reducing flame. These tables are obtainable from Stoe, Mechaniker, Heidelberg, and therefore are now available as standards for bead colorations. The first part of the work consisted in determining the percentage of metallic oxide present in the beads when presenting the color of the glass representing them on the plate. This we have determined for Fe, U, Cr, V, Mo, Cu, Co, Ni, Mn, Ti and W. These being known, the substance to be tested is weighed off, and enough taken up in a bead to give the standard color. The bead is then weighed, and from the known percentage required to give this color, the amount of coloring oxide is determined. These being known, the substance to be being determined by a second weighing, the percentage of metallic oxide in it is known. The accuracy varies from one to

five per cent. The time necessary is fifteen to twenty minutes. A balance weighing to 0.01 mg. is necessary, if direct weighings are made, but, by a slight modification of the *modus operandi*, satisfactory results may be obtained with a portable balance weighing to 0.1 mg.

*Glucose Determination:* EDWARD GUDEMAN.

The determination of glucose or grape sugars by use of the polariscope gives incorrect results, due to the variation of the rotating power of these substances being between 80 and 198, instead of the constant 175, generally accepted. Method suggested consists in determining the reducing power on Fehling solution directly, after inversion at 67° C. and after treatment with malt (as for starch analyses). Invert sugar is determined by double polarization at 20° and 87° C. From these results the amount of reducing and non-reducing substances from the glucose or grape sugar is directly calculated, and the sum of the two taken as the actual amount of commercial glucose or grape sugar present in the mixtures.

*The Identification, Composition and Analysis of Malt Liquors:* CHARLES LATHROP PARSONS.

In three of our northeastern prohibition states the statutes forbid the sale of 'malt liquors.' The task of the chemist is not therefore the usual one of simple alcohol contents, but he is required to prove that the liquor under examination was brewed from malt. The paper gives the analysis of a large number of such liquors and of a few imitations. The identification is mainly accomplished by means of the albuminoids, phosphates, and ash constituents. Analyses show a decidedly poor quality of malt liquor sold in these states and that the percentages of sulfates in the ash are abnormally large, indicating very extensive use of glucose. The chief modifications in the

methods of analysis from the official methods were the application of Hind's photometric method for sulfates to the ash and the volumetric determination of phosphates in the ash by uranium acetate, after moistening with concentrated hydrochloric acid and evaporation on the water-bath. (To be published in the *Journal of the American Chemical Society*.)

*The Distribution of Hydrogen Sulfid to Laboratory Classes:* CHARLES LATHROP PARSONS.

Describes a new generator having the advantages of the perfect automatic action of the Kipp generator, greater regularity of pressure, no second contact with the sulfuric acid, practically complete neutralization of the acid, and its immediate removal from the field of action so that no stoppage from the ferrous sulfate occurs. Coupled with this is used a long lead delivery pipe with exits where desired. These exits are of thermometer tubing specially bent, and of such a length that the student can secure only a limited flow of gas of from one to two bubbles a second. (To be published in the *Journal of the American Chemical Society*.)

*The Influence of the Growth of Mold upon the Chemical Composition of Oleomargarine and Butter:* C. A. CRAMPTON, Washington, D. C.

Analytical results are given of the values obtained from a series of samples of oleomargarine which had been kept three years and had become infected with a growth of mold. These results showed great variation in composition of the fat, chiefly induced by the mold. The practical lesson is considered, in the way of the interpretation of analytical results, and also the theoretical bearing upon the causes and character of rancidity changes in fats. The paper includes a brief résumé of the more recent articles on this subject, and the author con-

siders that his results bear very strongly in favor of the theory that the rancidity of fats is brought about (primarily, at least) by the influence of the growth of micro-organisms, or the enzymes produced thereby.

*On Carbyl Salts:* M. GOMBERG.

The paper dealt with results obtained, proving beyond doubt that certain organic halogen compounds must be considered as *salts*, from the chemical as well as the physical point of view, being strong electrolytes. The theory of dissociation can therefore be applied to substances other than those which have been classed as *acids*, *bases* and *salts*.

*Some Preliminary Experiments upon the Clinkering of Portland Cements:* E. D. CAMPBELL.

In the first part of the paper the author describes the method used in preparing a number of mixtures of marl and clay or shale. These mixtures were burned in a rotary cement kiln, a description of which appeared in the *Journal of the American Chemical Society*, Vol. 24, No. 3, p. 248. During each burning a series of samples of clinker was collected at temperatures differing by 22° to 30°. Tests of the time of setting and the behavior of the pats, after keeping twenty-four hours in boiling water, were made on each sample of clinker collected. The details of the influence of the temperature of burning on the pats from each series are given in seventeen tables; all the results are summarized in one large table, and compared with those of A. Meyer (*Thonindustrie Zeitung*, Vol. 73, p. 1201). The author has summarized the preliminary work as follows:

Viewed from the standpoint of the influence of chemical composition upon the changes in temperature necessary to pro-

duce a sound cement, and the temperature at which the clinker will give trouble by sticking in the rotary, we find to be: The minimum temperature necessary to produce Portland cement which will give a perfect pat test *from fresh clinker* is about 1450° C. This temperature is for minimum amount of CaO. It increases with increase of CaO, until in ordinary commercial cements it reaches 1550°. With the most heavily limed commercial cements this figure would be somewhat higher. It depends somewhat on the length of time required to pass through the rotary, slow driving tending to lower the temperature. The substitution of  $\text{Al}_2\text{O}_3$  or  $\text{Fe}_2\text{O}_3$  for  $\text{SiO}_2$ , that is, the use of a richer clay, lowers the over-burning temperature, but may lower or raise the temperature required for perfect hot test. With mixtures high in CaO, the burning temperature for perfect hot test is lowered by this substitution, but with mixtures high in CaO, the burning temperature required for perfect hot test is raised and may become coincident with the overburning temperature. Any attempt to raise the over-burning temperature by increasing the proportion of lime will fail to give a perfect hot test, even at the over-burning temperature. This is a confirmation of what manufacturing experience has shown, that with lean clays heavily limed there is a margin between the proper clinkering temperature and the over-burning temperature, while with rich clays, in order to prevent the clinker from balling up great care must be exercised to maintain the proper clinkering temperature. With the amount of CaO found in ordinary cement the introduction of eight or nine per cent. of magnesium oxide has but little influence on the temperature for perfect hot test or over-burning temperature. So far as the clinker is concerned, magnesium, as has been maintained by Newberry, acts as an inert substance.

*A New Glass of Low Solubility:* G. E. BARTON.

The statement in a recent number of SCIENCE to the effect that American glass is inferior to that made in Germany is without doubt true if for 'Germany' we read 'Jena.' The grounds for the claim that at least one glass made in this country heretofore has been equal to anything made on the continent except Jena glass, I submit herewith. I have here also samples of a new glass of my own devising which is the equal of the Jena glass as regards its resistance to water, acids and carbonates, and superior in its resistance to caustic alkali solutions. I believe this glass will render the statement in SCIENCE obsolete. Solubility tests of Whittall Tatum Company, Kavalier, Jena, and the new glass were made by determining the loss in weight sustained by pint flasks when boiled for three hours with solutions of the strength shown in the table, under an inverted condenser. Further details of the method, together with a brief explanation of the reasons for choosing such a method in preference to others, will be found in the complete paper which will be published in the *Journal of the American Chemical Society*. The results obtained were as follows, each figure being the average of three results:

LOSS PER FLASK EXPRESSED IN MILLIGRAMS.

	Whittall Tatum Co.	Kava- lier.	Jena.	New Glass.
1% Na <sub>2</sub> CO <sub>3</sub> sol. ....	134.4	126.6	30.6	32.3
Water. ....	8.4	20.6	1.1	.7
0.4% HCl sol. ....	4.7	16.2	1.3	1.5
1% NaOH sol. ....	100.1	78.4	97.1	89.0
Total. ....	247.6	241.8	130.1	123.5

The variations between the new glass and the Jena glass are, with the exception of the solubility in one per cent. sodium hydrate solution, within the limits of factory practice. In resisting the last solution, however, the new glass is over eight per cent. better.

*A Process for Rendering Phosphoric Acid Available:* CHARLES BASKERVILLE. Abstract published in the issue of SCIENCE for August 8.

*A Contribution to the Chemistry of some of the Asphalt Rocks found in Texas:* HENRY WINSTON HARPER.

This paper constitutes Chapter V. of Bulletin No. 8, the University of Texas Mineral Survey ('Coals, Lignites and Asphalt Rocks of Texas'). It contains new analytical data and it is a contribution to the chemistry of the asphalt rocks and some of the asphalt industrial products of Texas. The paper includes an introduction, analytical methods used, nomenclature, the limits of the proportion of petroleum to asphaltene in asphalts intended for paving purposes, constituents that lessen the value of asphalts used for paving purposes, the specimens examined. The experimental part contains tabulated results which show: loss of weight in vacuo over sulphuric acid 24 hours at room temperature (21°–23° C.); loss of weight when heated and maintained at various temperatures four and seven hours; the influence of a temperature of 160° C. upon the constituents of some asphalt rocks; and many other chemical and physical points of interest regarding the Texas asphalts. It also contains an examination of the percentage of petroleum and asphaltene in the total bitumen; the influence of a temperature of 160° C., continued one hour, upon the percentage of total bitumen in the samples used and upon the percentage of petroleum and asphaltene in the total bitumen; percentage of loss of total bitumen and the percentage of petroleum and asphaltene in the samples treated; analyses of the ash of samples; the bitumen of the asphalt rocks of Texas—preliminary investigation; the petroleum complexes obtained from samples 1605, 1606, 1607—treatment of these complexes

with fuming nitric acid; the action of an alcoholic solution of mercuric chloride and acetate of soda on same; the action of sulphuric acid upon petroleues 1605, 1606, 1607; bromine absorption and hydrobromic acid produced; the asphaltene complexes obtained from samples 1605, 1606, 1607; treatment of same with fuming nitric acid; bromine absorption and hydrobromic acid produced; the chloroform soluble; 'soft gum' and 'hard gum'—industrial products obtained from Uvalde asphalt rock; proximate and ultimate composition of same; synoptic table of the ultimate analyses; table showing bromine absorption, hydrobromic acid liberated, and sulphur and nitrogen in the petroleue and asphaltene complexes obtained from the asphalt rocks of Texas; bromine absorption and sulphur in asphalts, etc.; heavy crude petroleum from Watters Park, Texas; proximate analysis of the residuum of sample 1601; summary of results.

On account of the large amount of analytical data presented a satisfactory abstract of the paper is impracticable.

*Occurrence and Importance of Soluble Manganese Salts in Soils:* E. E. EWELL.

In the course of a qualitative examination of an acid soil which failed to grow leguminous crops, it was discovered that the soil contained a very considerable percentage of manganese compounds soluble in water. An aqueous extract of the soil has been found to contain about twice as much manganese as calcium. It is believed that this high proportion of manganese in the soluble salts of this soil contributes very largely to its sterility. The occurrence of soluble manganese compounds in soils has received so little attention in the past that an extended investigation of the occurrence of this element in soils has been undertaken by the Bureau of Chemistry of the U. S. Department of Agriculture. The investi-

gation will include a study of the effects of soluble manganese salts on plants, and the agricultural importance of manganese in soils.

*Black Rain in North Carolina:* CHAS. BASKERVILLE and H. R. WELLER. Abstract published in the issue of SCIENCE for August 8.

*A Modification of the Calorimetric Method of Determining the Heat of Chemical Reactions:* ALBERT W. SMITH and EDWARD J. HUMEL.

The modification consists in keeping the contents of the calorimeter during the reaction whose change of heat is to be measured, at exactly the room temperature, by the addition of water at the melting point of ice. The method was proposed some years ago by F. A. Waterman for the determination of the specific heat of metals. It was found to be capable of yielding very accurate results in determining the heating value of fuels by the bomb-combustion method, doing away wholly with two troublesome sources of error in this determination, namely, the water equivalent of the apparatus and the loss or gain of heat by the apparatus from radiation. The number of heat units is found from the weight of ice water added and the room temperature, both of which factors are easily and accurately determinable.

*A Source of Error in the Chromic Acid Method of Determining Carbon in Iron:* ALBERT W. SMITH and BURTON B. NIERING.

It was found that when the exit gases from the apparatus, used for the determination of carbon in iron, during the oxidation by chromic and sulphuric acids were passed over pentoxide of iodine heated to 150°, the presence of unoxidized carbon in the form of carbon monoxide could always be detected, usually in material quantities,

often sufficiently large to cause serious error in the determination.

The following papers were also read:

'Bessemer and Open-hearth Steel Practice': EDWARD H. MARTIN and WM. BOSTWICK.

'Manufacture of Optical Glass': GEO. A. MACBETH.

'The Ozone from Potassium Chlorate': EDWARD HART. (By title.)

'Malleable Iron': H. E. DILLER.

'The Old and the New in Steel Manufacture': WM. METCALF.

'The Exactness of Faraday's Law': T. W. RICHARDS.

'Ionic Velocities in Liquid Ammonia Solution': E. C. FRANKLIN.

'Solubility, Electrolytic Conductivity, and Chemical Action in Liquid Hydrocyanic Acid': LOUIS KAHLBERG and HERMAN SCHLUNDT. (By title.)

'Molecular Attraction': J. E. MILLS. (By title.)

'A New Apparatus for Measuring the Coefficient of Expansion of Gases': T. W. RICHARDS and K. L. MARK.

'Electrolytic Deoxidation of Potassium Chlorate': WILDER D. BANCROFT. (By title.)

'The Solid Phases in Certain Alloys': WILDER D. BANCROFT. (By title.)

'Otto Hoffman By-product Coke': C. G. ATWATER.

'Crucible Steel Manufacture': E. L. FRENCH.

'A Proposed Distillation Test for Fireproofed Wood': C. F. McKENNA. (By title.)

'Comparison of Results Obtained by Different Methods of Determining the Amount of Oxygen Absorbed by Waters Containing Oxidizable Substances': LEONARD P. KINNICUTT. (By title.)

'An Improved Grinder for Analyses of Mother-beets': DAVID L. DAVOLL, JR. (By title.)

'Electric Combustion': EDWARD HART. (In abstract.)

'The Retention of Arsenic by Iron in the Marsh Test': C. L. PARSONS and M. A. STEWART.

'A New Electric Test Retort': CHAS. F. McKENNA. (By title.)

'The Distribution of Hydrogen Sulphide to Laboratory Classes': C. L. PARSONS. (By title.)

'The Hydrolysis of Maltose and Dextrine for the Determination of Starch': W. A. NOYES, G. CRAWFORD, C. H. JUMPER and E. L. FLORY.

'Some Notes on Glass and Glass Making': ROBERT LINTON.

'Plate Glass Manufacture': F. P. MASON. (By title.)

'Symmetrical Trimethylbenzyl, Symmetrical Trimethylbenzol Hydrazone and some of its Derivatives': EVERHARDT P. HARDING.

'1-4-Dimethylbenzyl, 1-4-Dimethylbenzol Hydrazone and some Derivatives': EVERHART P. HARDING.

'The Action of Valerianic Acid and Valeric Aldehyde upon Antipyrin': DAVID C. ECCLES. (By title.)

'A Chemical Study of the Pitch of the Northern Pine': G. B. FRANKFORTER.

'Derivatives of Eugenol': G. B. FRANKFORTER and MAX LANDO.

'The Reaction of Bromine upon Oxalic Acid': T. W. RICHARDS and W. N. STULL. (By title.)

'Isomeric Oxy-Azocompounds': W. MCPHERSON. (By title.)

'Reaction between Acid and Basic Amides in Solution in Liquid Ammonia': E. C. FRANKLIN and O. F. STAFFORD.

'Picryl Derivatives of some Phenols': H. W. HILLYER. (By title.)

'Camphoric Acid: Synthesis of Trimethylparaconic Acid': W. A. NOYES and A. M. PATTERSON.

'Recent Progress in the Fireproofing Treatment of Wood': S. P. SADTLER. (Will be printed in SCIENCE.)

'Manufacture of White Lead': G. O. SMITH.

'On some Expansion Measurements of Portland Cement': E. D. CAMPBELL. (By title.)

'The Probable Existence of a New Carbide of Iron': E. D. CAMPBELL. (By title.)

'The Discovery of a Dextrose Factor in Saturated Cane Sugar Solutions': L. W. WILKINSON. (By title.)

'The Composition of Myrtle Wax': W. R. SMITH and F. B. WADE.

Pittsburgh being at the center of the region of greatest iron and steel production of the United States, opportunities were offered the members to inspect many of the great metallurgical establishments. Visits were made also to the works of the H. J. Heinz Company, manufacturers of food products, to the oil works of the Atlantic Refining Company, to the oil wells of the Forest Oil Company, and to the Demmler works of the American Tin Plate Company. The many courtesies shown by the officers of these works added much to the pleasure and interest of the Pittsburgh meeting.